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THE IMPROVEMENT OF CLINICAL AND FUNCTIONAL RESULTS OF SURGICAL CORRECTION OF PECTUS EXCAVATUM IN CHILDREN AND ADOLESCENTS

ABSTRACT

The article reflects the relevance of the problem of surgical treatment of pectus excavatum (PE) in children; a comparative analysis of surgical treatment of patients with PE is presented, major part of which was operated by the Nuss-procedure method. The main advantages of this method, aimed at reducing intraoperative and postoperative complications, contributing to the reduction of the period of complete rehabilitation of the patient, are distinguished.

Keywords: children, pectus excavatum, the Nuss thoracoplasty, complications.

INTRODUCTION

Pectus excavatum is a severe dysplastic malformation of the connective tissue of the sternocostal complex [1]. The frequency of this defect, according to domestic authors, varies from 0.6 to 2.3%, according to foreign authors varies depending on the region from 0.2 to 1.3%. Traditionally, the indications for surgical correction are functional disturbances of respiratory and cardiovascular systems, the intensity of which are directly related to the degree of deformation [2, 3]. In adolescence, the leading factor is psychoemotional one, a complex of physical inferiority, which makes one consult a doctor to correct this defect. More than 50 variants of deformation correction have been proposed, most of the generally accepted surgical procedures give good functional results, but they do not completely solve such existing problems as minimally invasiveness, radicalism and cosmeticity. According to the literature postoperative complications, relapse of deformity in children occur in 15-25% of cases. This problem remains urgent and requires further solutions.

In 1998 a surgeon Donald Nuss published a 10-year experience in treating pectus excavatum in children, calling his method as a minimally invasive technique for correction of congenital deformity of the chest [6]. A new approach involves the correction of a deformed sternocostal complex without resection of the costal cartilages and sternotomy. The method is widely used in pediatric surgeons around the world. Since 2009, our clinic has been using the «Nuss-procedure».

MATERIALS AND METHODS OF RESEARCH

For the period from 2009 to 2017in the surgical department of the Pediatric Center of the Republican Hospital No. 1 of the National Center of Medicine in Yakutsk sternochondrodistraction by Nassau was performed for 65 patients in treating pectus excavatum (Table 1).

The majority of patients (63%) were boys. In 56% of cases, the operation was performed at the age of 9 to 14 years. By the degree of deformation of the chest: 40 patients had 3dgrade deformity (61.5%), other 25 children had deformation of the 2nd degree according to Gizhitskaya. In addition, 8 children (12.3%) had an asymmetric deformation at pectus excavatum. Marfan-like syndrome was found in 10% of patients with pectus excavatum, these children were diagnosed with small heart anomalies, signs of disrupted maturation of connective tissue (arachnodactyly, platypodia, carriage disorders). In a complex of preoperative examination, along with conventional methods, chest X-ray in two projections, echocardiogram, according to the indications consultations of cardiologist and genetics were included.

Support plates of titanium alloy BT6, size V-240T up to V-360T (JSC «KIMPF»), width from 15 mm to 20 mm, thickness from 1.7 mm to 2.8 mm and special guide (JSC «KIMPF») were used. The size of the plate was selected beforehand in advance, taking into account the age and dimensions of the child's chest. The shape of the plate bending was formed individually with the technician of the operating unit, depending on the type and degree of deformation. The operation was performed under combined endotracheal anesthesia in combination with epidural anesthesia. The technique of the operation was as follows: the cuts of the skin were made on the axillary lines from both sides, focusing on the deepest point of the funnel-shaped deformation. Under the pectoral muscles along the corresponding intercostal space a tunnel was formed with a help of a special guide. Further from left to the right a supporting titanium plate was carried and rotated 180 degrees, then it was fixed to the corresponding underlying ribs on both sides.

RESULTS AND DISCUSSION

Intraoperative correction of expressed deformity of the chest was achieved in all

Table 1

Distribution of children by age and gender, abs.number (%)

Gender	Age, years					
	4 – 5	6 – 8	9 – 11	12 – 14	15 – 16	All ages
boys	6	8	13	9	5	41 (63)
girls	3	4	7	8	2	24 (37)
total	9 (138)	12 (184)	20 (307)	17 (261)	7 (107)	65 (100)

children. The duration of the operation was from 25 to 55 minutes (an average of 35 minutes). Transfusions of blood and blood products during operations were not required in any case. The children were in the intensive care unit. Medication therapy included antibacterial, hemostatic therapy, analgesia with non-narcotic analgesics and epidural blockade for 48-72 hours. In connection with the specific operation, the pressure caused by the plate is much greater than with standard thoracoplasties. It causes a full-blown pain syndrome in the early postoperative period. The introduction of extended epidural anesthesia allows children not to feel pain and avoid prescribing narcotic analgesics. Epidural anesthesia has been used in our clinic since 2013 and the effectiveness of this type of anesthesia has been clinically proven.

Postoperative complication in the form of pneumothorax was observed in 4 cases, which were 6%. Purulent-inflammatory complications, postoperative bleedings were not revealed. In the literature, cases of damage to the mediastinal organs during the «blind» plate, including the wound of the heart, are described. In connection with it many surgeons performed the stages of the formation of the median tunnel and the conducting of the plate under the control of a videothoracoscopy [4, 5]. As the experience of the leading clinics shows [2], the formation of the tunnel from left to the right is the safest, since in this way the tool does not rest on the heart, but goes along the tangent. We did not use videothoracoscopic control when conducting the plate.

In all cases correction of deformation was achieved, an excellent functional and cosmetic result was obtained in 92% of the operated children. The duration of inpatient treatment averaged 10 bed-days. After discharge, we recommended physical training, swimming. We prohibited the practice of jumping sports and wrestling. Plates were removed after 3 years, migration and displacement of metal structures were not detected. Removal of the plate did not cause complications.

Until 2009, in our clinic in the treatment of pectus excavatum thoracoplasty by Paltia was used. The duration of the operation was on average 120 minutes, accompanied by severe blood loss and in 90% of cases there was a need for blood transfusion. Complications in the form of bleeding or pneumothorax were observed in 35% of cases. The duration of hospitalization was 20-25 days. In the long term, in 20% of cases, migration of the plate was observed, which required the re-installation of metal structures. In 12% of cases, in the long term after a removal of the plate, a relapse of the deformation of sternocostal complex was detected.

Table 2

Comparative characteristics of thoracoplasty technique

Procedure	Mean duration of operation, min	Complications, %	Duration of anesthesia, days	Displacement of plate, %	Bed days	Relapse, %
Paltia	120	35	8 – 12	20	22	12
Nass	35	6	5 – 7	-	10	-

Comparative evaluation of operations (Table No. 2) revealed the advantages of Nass's procedure, namely:

1. Minimal trauma;
2. Uncomplicated postoperative period;
3. The best cosmetic result.

Thus, the correction of pectus excavatum by the Nass method allows to obtain the best cosmetic and functional result and it is the method of choice.

CONCLUSIONS

1. Sternochondrodistraction by Nass method is an effective safest method for eliminating pectus excavatum in children.
2. The majority of patients (92%) have an excellent functional and cosmetic result.
3. In 5% of cases there were complications in the early postoperative period in the form of pneumothorax due to injury of the parietal pleura during the intervention.
4. The use of epidural anesthesia effectively reduces pain syndrome in the early postoperative period.

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